

THE IMPROVEMENTS IN MACHINE TOOLS.

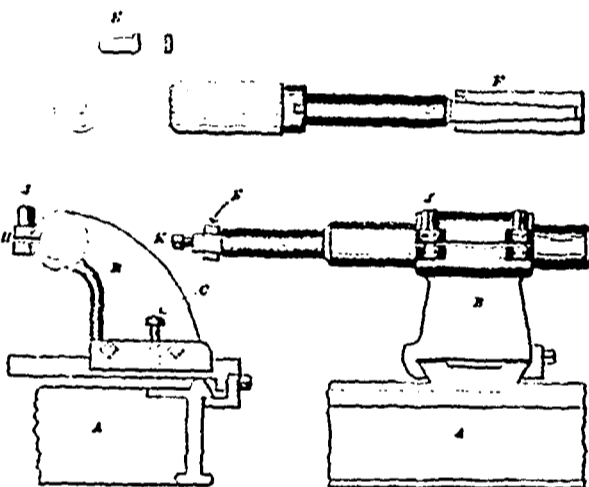
By "C. H. M."

DURING a recent inspection of a modern machine shop I was deeply impressed by the radical changes and improvements in the machinery and the methods of to-day as compared with those used in the shops twenty or more years ago. The progress in the system, organization and processes of manufacturing machinery has no doubt been as rapid as in any other branch of industry. And why not? To the mechanic, especially to the machinist and milling engineer, largely belongs the duty of inventing and developing the improvements of all classes of machinery, and surely they would not be consistent if they neglected those machines with which they come in daily contact and which are used in the production of all other machinery for every purpose. It has been said that lathes, planers and drills have not been changed or improved much in the last twenty years. They who make such statements have evidently not been close students or they did not have to do with the machine tools of the earlier days. About twenty-two years ago I started my apprenticeship in the largest and best machine shop in a city of 60,000 inhabitants, and I well remember the class of tools I served my time with; lathes of all descriptions with wood frames, light iron ways, chain feeds, cast-iron headstock and tailstock, spindles of small diameter, fine pitch, narrow face, back gears, narrow belted cones, skeleton tool posts and such. There were a few lathes in the shop built of "all iron and steel" that were not much better than their wood-frame neighbors, either in appearance, strength, utility, or accuracy of workmanship and production. Still fewer lathes we had that would cut threads and none that would cut a large square thread cider-press screw and nut that agreed. As for planers, they were not much better. There was one planer about 28 inches wide by 10 feet long, the first one ever used in the city, and I guess it weighed about 4,000 pounds. It would plane every way except parallel, straight and square. It had a pair of raising screws for the cross rail that, as I now recollect them, were about 4 and 3-7 threads per inch. One of them had worn the nut out and the new one was cut 4 and 3-8 per inch for lack of suitable gears to cut the proper, or rather improper, mongrel head. This necessitated the constant use of a surface-gauge every time the height of the cross rail was changed! The crank-planer was on a par with the times when it was made and might have had power to take a respectable cut on metal. If it had, no one ever demonstrated the fact. One large drill-press had its table drilled off and a substitute was made from a portion of a heavy oak plank, which warped to a beautiful dish pattern when the big cylinder stove was first fired up in the cold weather. Its spindle would drop nearly one-half an inch when going through the hole, and as a matter of course the blacksmith was kept busy redressing flat drills. Another small drill press was built to set on the ordinary machinist bench, but "the powers that were" set it up on a pair of (saw) horses in the middle of the floor to make it more accessible for work and other things. They succeeded beyond their most sanguine hopes, for it was the most accessible tool I ever saw for anything but work. The horses served for every large casting to be set up and braced against. Castings large and small were thrown under them. Old broken castings, scrap iron, pieces of so-called drills, chips, waste and all other kinds of dirt common to the general jobbing machine shop found shelter under and around the protecting wings or legs of this drill-press. Some readers may think this an exaggerated description, but I can assure them that I was considered fortunate in securing an opportunity of learning my trade in the best-equipped shop in town, and there were several of them.

The same general brief description of machine-tools will also serve for a large majority of shops throughout the country at that period. Now all these things are changed and such scenes as described are rare—in fact in the minority. Lathes are common that will cut accurate threads of all shapes, sizes and leads except fractional threads. They will bore straight, true holes and turn true cylindrical work. They have plenty of "all iron and steel" in their construction and are well proportioned, with large stiff steel spindles, strong back gears and generous cone belts. They show large ways for the carriage to travel on. The carriages have ample bearing surfaces. Lead screws are larger, stronger, and, as a rule, coarser in pitch. Reverse or frog-gearing is stronger and better arranged.

Planers have been subjected to the same improving process as well as drill-presses and other machines. In addition to all this they have been improved by having new features added to them for the convenience of operators, as well as for facilitating and perfecting work.

But it is in the field of special tools and appliances for the rapid production of better work that the machinist's plant has been most improved, and to which I at the outset intended to confine myself most particularly, but it would take more than one article to tell these things, even in a brief manner. One of the most trying jobs that the machinist of "ye olden time" had to do was to bore out holes with the ordinary hook tool. They had to be bored through short hubs, through long hubs, through soft hubs, through hard hubs, through babbitt, brass, cast and wrought iron, and still they had to be bored large and small, have heavy cuts and light cuts, and in and through all kinds of cored holes chuck full of sand fresh from the foundry. Generally there were about six hook-heading tools in the shop and five men were using the best of them as each came to select them in his turn. John had a large hole that he could get a good heavy tool m, and as large castings are generally softer than smaller ones from the same heat he had a soft thing. James had a large hole, but perhaps projections forbade the use of anything but a small-necked tool, and he did not do as well. George had a lot of small gears or hubs to bore and he found the last tool which was a large as he could use but still light, springy and long, and when he started to cut on the first hole he found it as hard as steel and full of core gravel. The trouble commenced. The tool would chatter, squeal and jump, bob up and down and hit the hole occasionally and sometimes succeed in leaving its mark, but as for good clean cutting under the scale, that was out of the question. Old-fashioned boring machines were not built right for good results, and an honest every-day mechanic could not possibly produce a fair day's work under such conditions, and it made him tired of the old, shaky lathe, wooden cross-bar chuck and slender boring tool.



All these things are changed now for those who want to have them changed. Nice new chucking machines, both horizontal and upright, can be had now with good chucks, self-feeds and turret, with four or more holes for cutters and reamers to bore and finish holes and even face hubs without taking out or changing a hole. They will make thousands of holes alike and will probably produce more work in one day with a smart boy than the old method aided by a good mechanic would in a week. One machine of this class would keep the whole force of an average shop of fifty men busy finishing up what is outside of the holes they bore. They cost less for tools, attendance and operation than the three or four lathes used for the same work. They cost less for tools which last infinitely longer, take less room and save the cost of the three men on the lathes. There are shops that think, whether rightly or wrongly, that their business or capacity would not warrant such an investment and they would naturally prefer to have something better than the ordinary boring tool.

For such places I would recommend the above attachment, which can be made and placed on any ordinary lathe and used on almost every job where the common boring tool is used, especially for cored holes. A represents a section of the ordinary lathe-carriage on which the bar-holder B is placed, gibbed and doweled with pin C into proper alignment with the centres of the lathe. The holder is bored for the cutter-bar D. After being bored, it is split on one side at H and holds the bar by compression bolts J. The cutter-bar is mortised near the end and carries the cutter E which is held against its seat by set-screw K and shouldered so that it bears on either side of the bar. Two cutters with the reamers usually suffice to make a good, true, smooth hole. These cutters cut on both edges and to a certain extent support and keep each other from springing from the work, also cutting twice as fast as a single-pointed tool. The first cutter is made one-sixteenth less in diameter than the reamer and the second tool from one-one-hundredth to one-sixty-fourth less than the reamer, allowing the

reamer to cut only enough to properly finish the hole. The reamer G is held in the socket F, which is held in B the same as the cutter-bar. The advantage of this rig besides its increased capacity is as follows: The cutters are cheaply and easily made, cut both ends, do not wear out fast and when the large one wears too small it can be reground to the next size. The reamer is assured of equal duty at all times because too little or too much stock cannot be left for it and cheaper help can be employed to turn out at least twice the quantity that a good workman can possibly do without it. It is also easier for the lathe, as the twist and strain are equally divided. If you have not all the reamers you need, make a finishing cutter and your hole will be its size without the use of calipers, rule or any other measurement. Cutters should be marked their size and number as follows: First cutter is marked No. 1, 1 11-16, second cutter No. 2, 1 11-16 and so with all of them.

It will be found in practice that four bars from five to ten inches long in the stem will be sufficient for all the holes from one to three inches bore. Besides all these well-founded claims for it, any ordinary shop can make it at a slight cost, which is quite a consideration, and while this attachment is not claimed to be as good as a regular full-grown turret chucking-lathe, it will be found infinitely superior to the average boring tool and may be classed as a medium between the turret attachment and the common lathe and hook tool. We have had two sets of these attachments in our shops in daily use for the past ten years and would not part with them until we can get the turret chucking-lathe. We use hook boring tools only for odds and ends that come in without any standard size.

PUSH IN BUSINESS.

In no age of the world's history has push in business of every kind been as much needed as it is to-day, says the *Southern Publisher*. It is true all cannot get a front seat, but, according to an eminent Boston teacher of metaphysics, if you make up your mind that you will have one, you will attract the powers that carry you to the front seat. The confident, determined mood of mind, steadily kept up, brings to you other confident people; confidence in the business world means both cash and credit. What keeps thousands of noses on the grindstone of hard times is that they have no confidence or courage in themselves to take risks or responsibilities. They keep a poorhouse in their minds, and live in it. They aspire to be only screws in the business machine instead of striking out and making a machine of their own; they find fault with the monopolist, but the real slavery is in their own minds. They think there is no place for them at the head of the business; their first and great step toward staying permanently at the tail lies in thinking that they must remain there. Always aim high. A workingman ought never to look at a millionaire's palace without saying: "I am going to have a palace like that." His saying this in dead earnest is one thought among many others which pushes him forward. Your thought pushes you to do things.

Real business does not lie alone in being industrious. The goody-goody books and maxims have only told half the story about industry. A good deal depends upon what you are industrious about. If you spend all your time and strength in polishing pans or blacking boots, your industry won't carry you very high. The industrious mind plans in an hour what brings in more money than a tin-pan polisher could earn in a year. People who work only or mostly with their bodies have as good a right as the capitalist to work with their minds. The world always wants newer things, more curious things, more improved things, more amusing things. No workman in any trade, any art, any profession, should be content with doing what some one has done before him, even though he does it well. He should aim at doing something better than any one has done before him. When he can do this, he must next push it on the world's notice.

Push is a talent as much as skill in any art. Keep yourself before yourself in your mind as a pusher, and such frame of mind will at length make you push. There is a power in a continual imagination of yourself in any certain character which does make you more and more like such character. Success, like charity, must commence at home in the mind. If now you are compelled to live in a poor room and on poor fare, do so only under protest. Keep your mind on a better room and better fare. Don't say, "I s'pose I must always take up with this." Say instead, "I am going to have better things than these." You are then creating for yourself strength, not weakness; you are then ever strengthening this inexplicable mental attraction which will bring these things to you.